EXHIBIT A

US006685064B2

(12) **United States Patent**
Frutin

(10) **Patent No.: US 6,685,064 B2**
(45) **Date of Patent: Feb. 3, 2004**

(54) **DISPENSING APPARATUS**

(75) Inventor: **Bernard Derek Frutin**, Uplawmoor (GB)

(73) Assignee: **Rocep Lusol Holdings Limited**, Deanpark (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/169,290**

(22) PCT Filed: **Dec. 22, 2000**

(86) PCT No.: **PCT/GB00/04967**

§ 371 (c)(1),
(2), (4) Date: **Aug. 13, 2002**

(87) PCT Pub. No.: **WO01/49585**

PCT Pub. Date: **Jul. 12, 2001**

(65) **Prior Publication Data**

US 2003/0038148 A1 Feb. 27, 2003

(30) **Foreign Application Priority Data**

Dec. 30, 1999 (GB) 9930773

(51) **Int. Cl.**[7] **B65D 83/00**

(52) **U.S. Cl.** **222/402.15**; 222/402.21; 222/153.12

(58) **Field of Search** 222/402.1, 402.2, 222/402.15, 402.23, 402.11, 402.16, 402.14, 402.21, 402.22, 402.25, 153.11, 153.12, 153.13, 153.14, 389, 380

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,766,913	A	*	10/1956	Wilshusen	222/402.22
2,892,572	A	*	6/1959	Fredette et al.	222/153.06
3,395,838	A	*	8/1968	Beres et al.	222/402.14
4,454,963	A	*	6/1984	Fegley	222/5
4,669,639	A	*	6/1987	Klarenbach et al.	222/396
4,826,054	A	*	5/1989	Frutin	222/402.11
5,040,705	A		8/1991	Snell	
6,003,740	A		12/1999	Castaneda, Jr.	
6,321,951	B1	*	11/2001	Frutin	222/389
6,340,103	B1	*	1/2002	Scheindel et al.	222/402.15
6,474,510	B2	*	11/2002	Frutin	222/153.11

FOREIGN PATENT DOCUMENTS

EP	0243393	B	11/1987
GB	1359152	A	7/1974
WO	WO 9830469	A	7/1998
WO	WO 9918010	A	4/1999

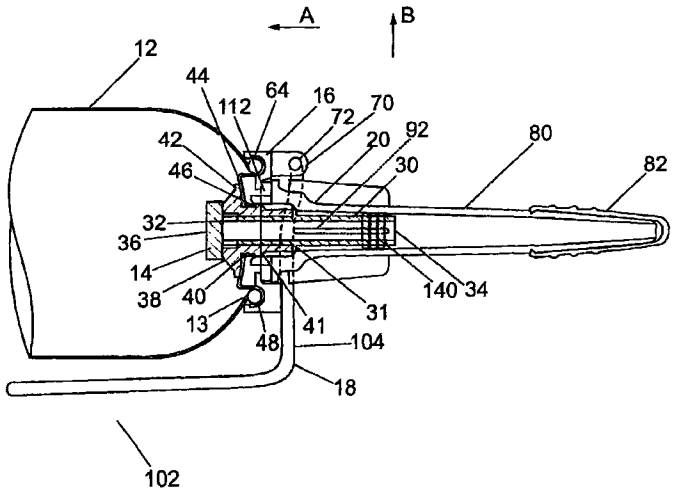
* cited by examiner

Primary Examiner—Gene Mancene
Assistant Examiner—Frederick C. Nicolas
(74) *Attorney, Agent, or Firm*—Drinker Biddle & Reath LLP

(57) **ABSTRACT**

A dispensing apparatus (**10**) for dispensing a product from a container (**12**) includes: a product chamber within the container (**12**); a valve (**14**) adjacent to the product chamber; a hinge assembly secured to the opening of the container and to which is connected a nozzle assembly (**20**); and a lever (**18**) attached by means of the hinge assembly. The nozzle assembly (**20**) is rotatable between open and closed positions and includes an actuator portion provided with a cam surface (**96, 98**) which co-operates with a bearing portion (**100**) on the lever (**18**) such that, when the nozzle assembly (**20**) is in the open position, operation of the lever (**18**) causes movement of the actuator portion to open the valve (**14**) and permit flow of the product out of the container (**12**).

9 Claims, 6 Drawing Sheets



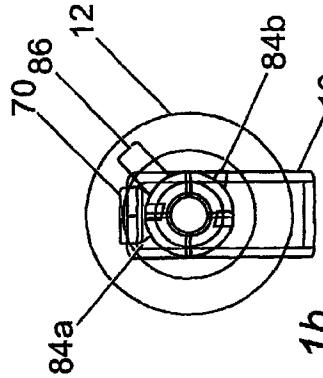


Fig. 1b

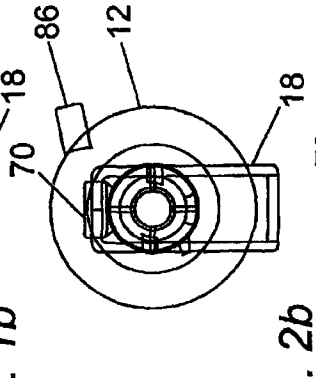


Fig. 2b

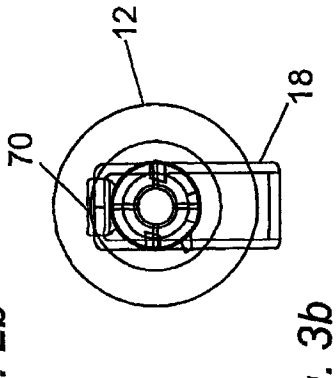


Fig. 3b

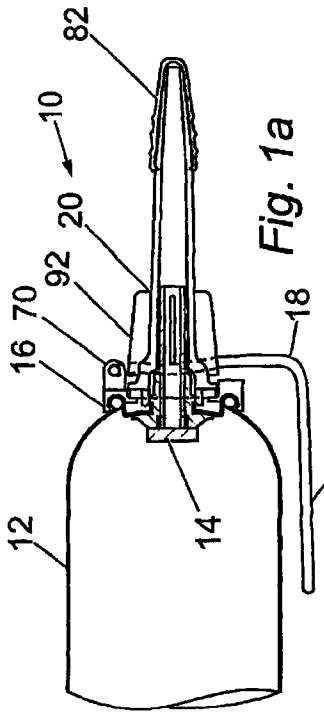


Fig. 1a

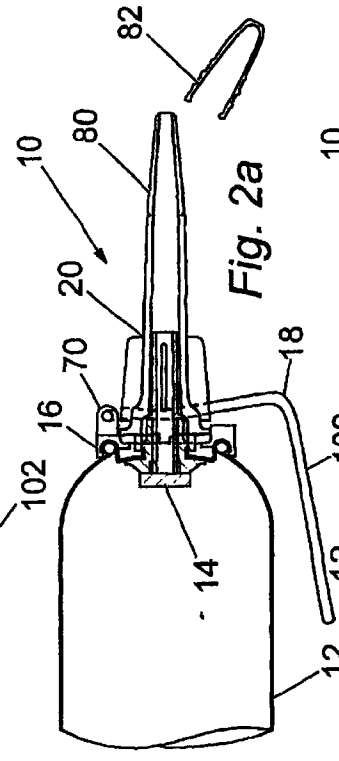


Fig. 2a

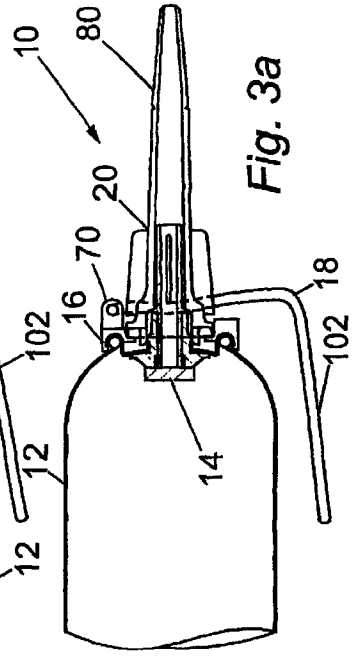


Fig. 3a

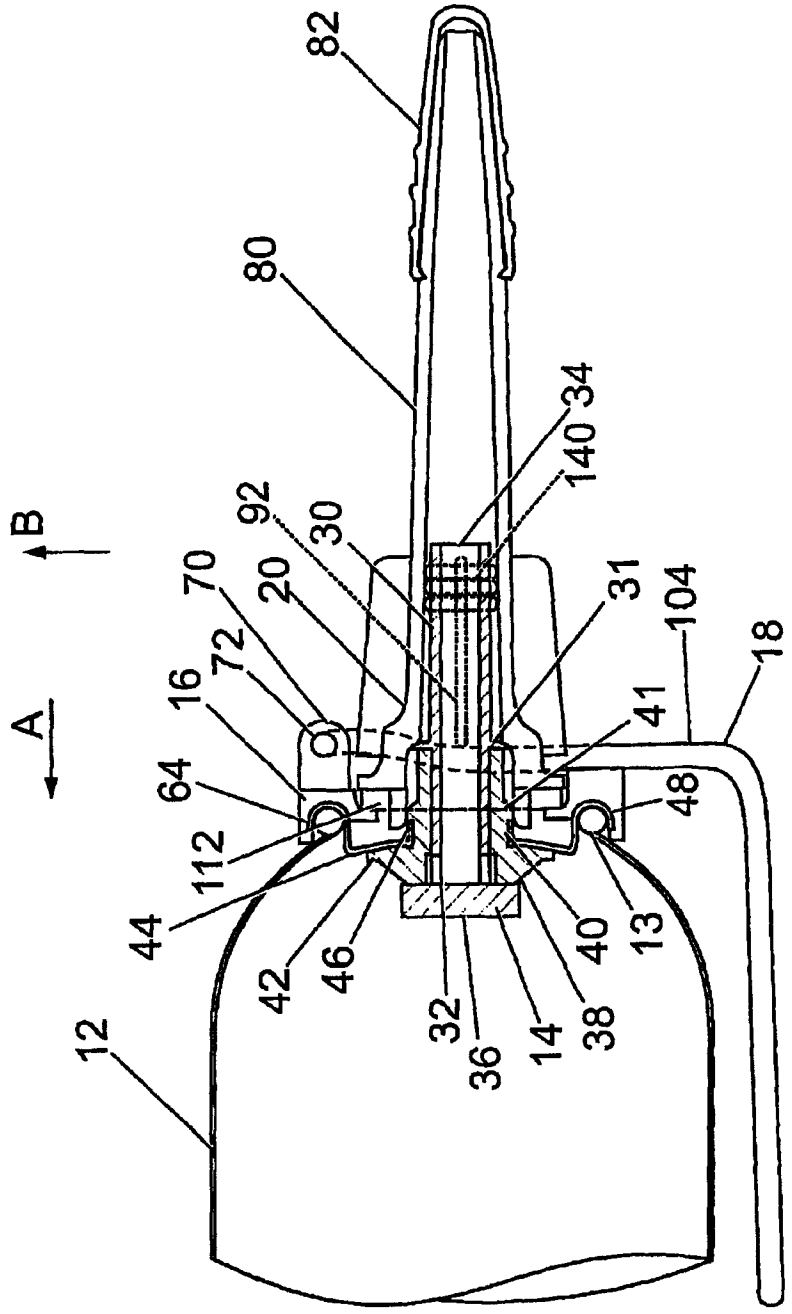

82
80
34
140
92
30
B
70
20
31
104
18
72
16
41
A
64
48
112
44
42
46
32
36
14
38
40
13
12
102

Fig. 4

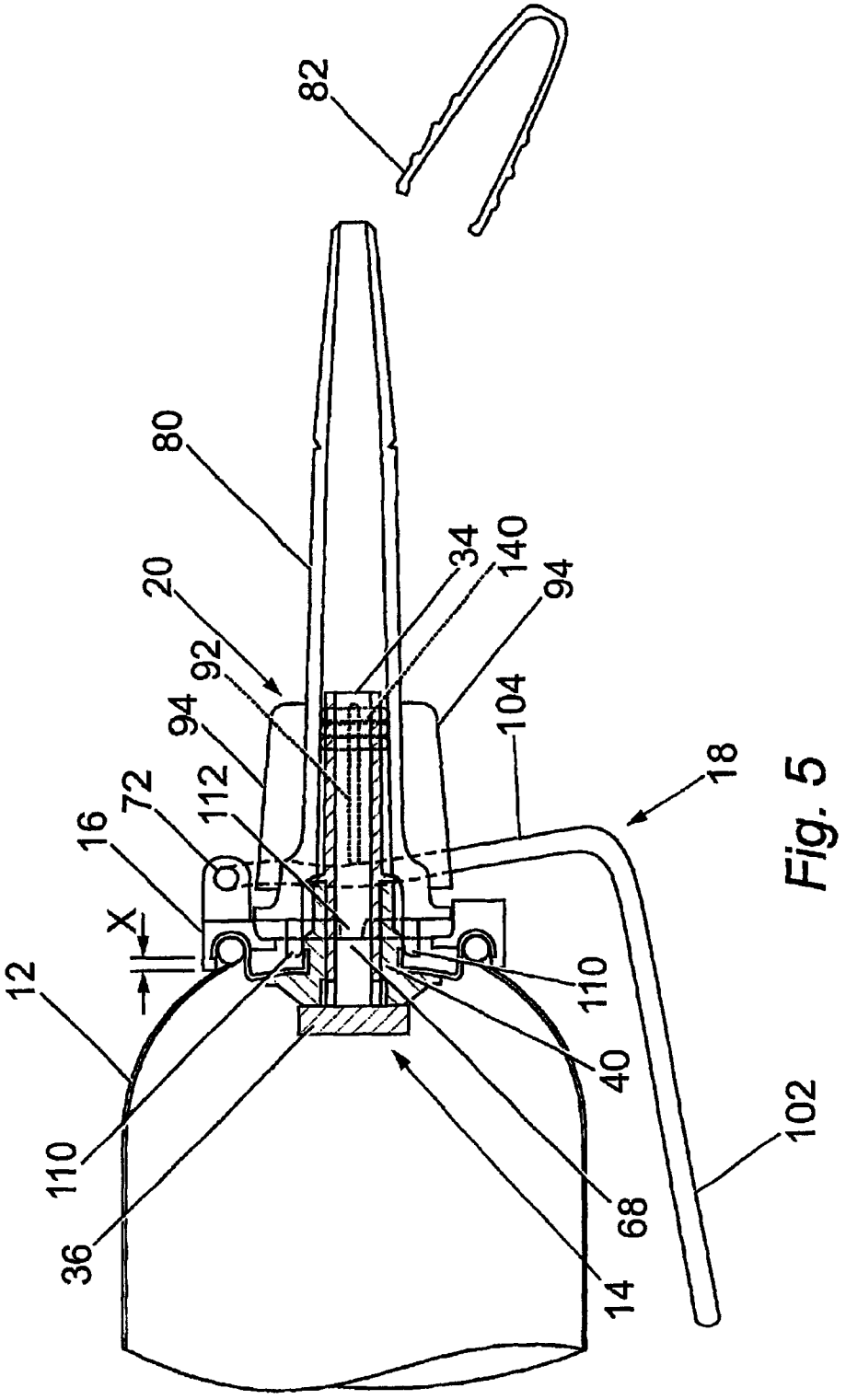


Fig. 5

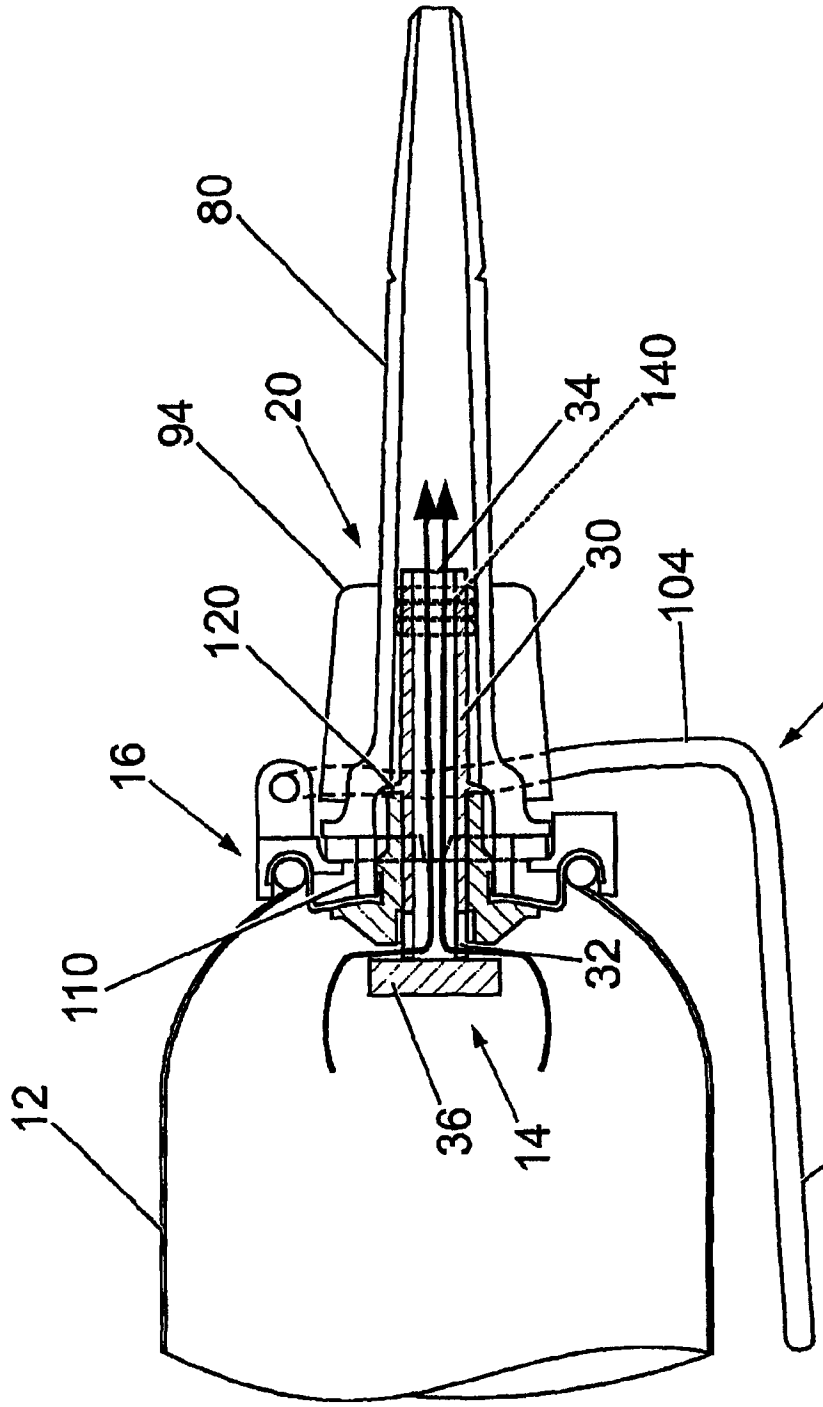


Fig. 6

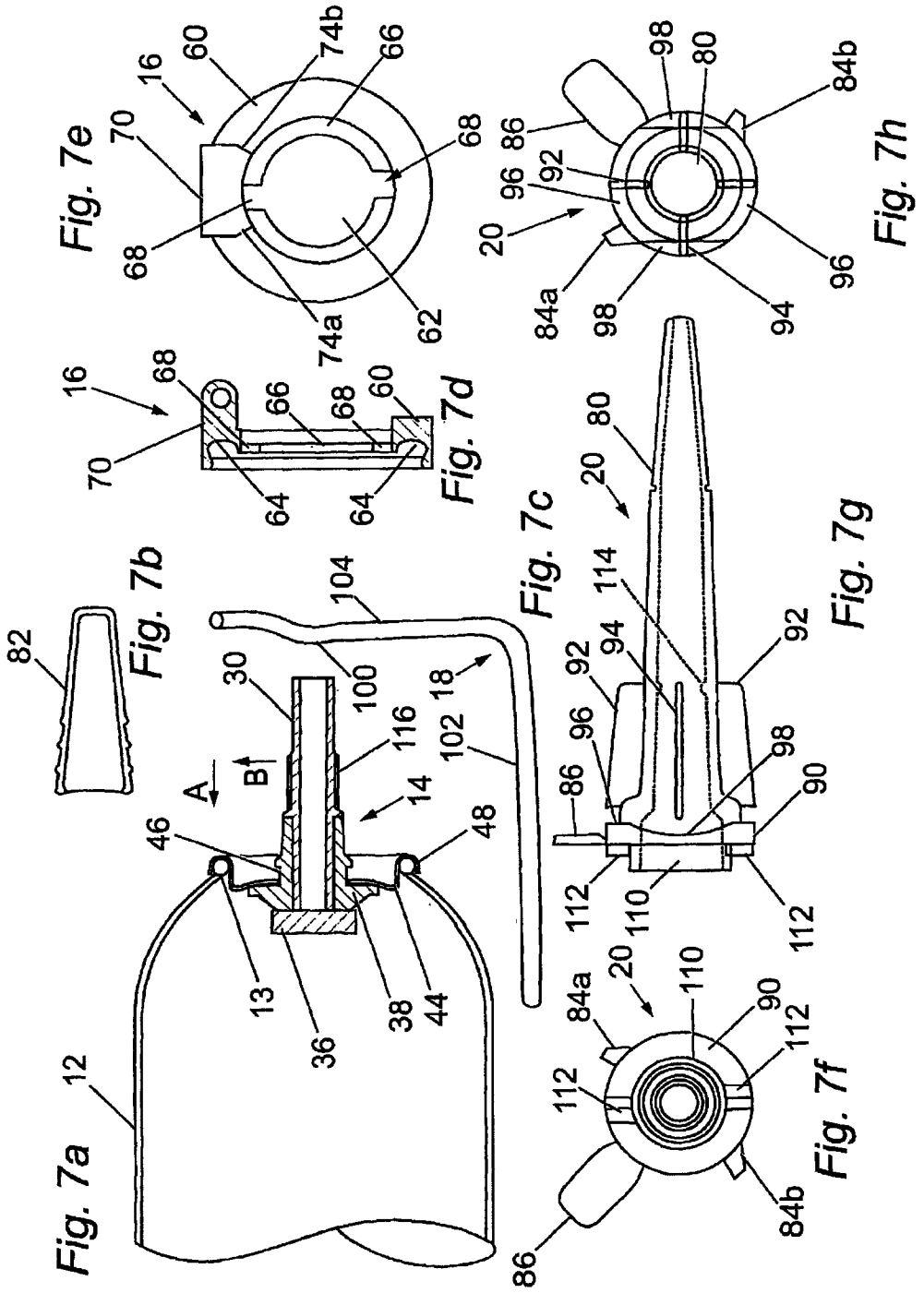


Fig. 7e
Fig. 7d
Fig. 7h
Fig. 7c
Fig. 7g
Fig. 7b
Fig. 7f
Fig. 7a

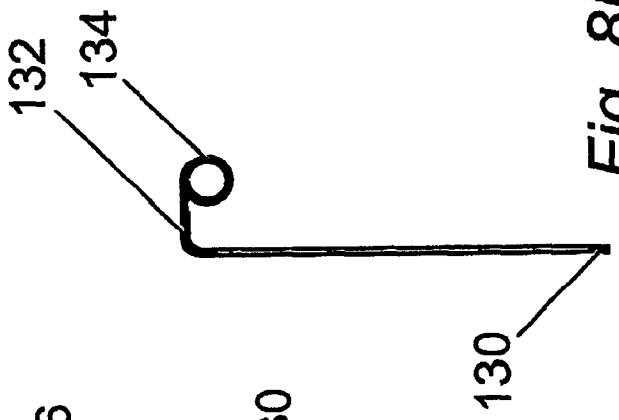


Fig. 8b

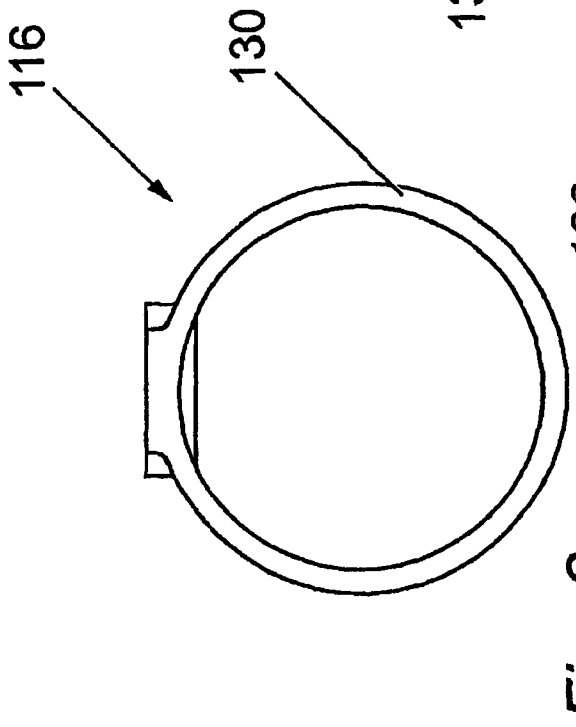


Fig. 8a

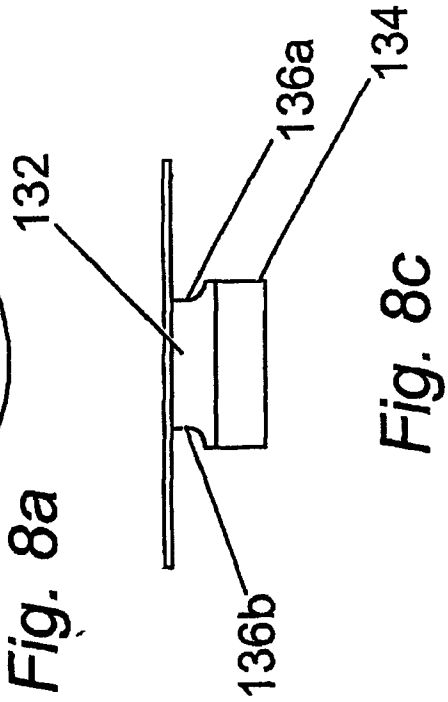


Fig. 8c

DISPENSING APPARATUS

SUMMARY OF THE INVENTION

This invention relates to dispensing apparatus. Particularly, but not exclusively it relates to dispensing apparatus for dispensing viscous materials from a container under pressure of a propellant.

Known dispensing apparatus commonly includes a valve mechanism fitted to a container which is refilled with a product, for example mastic or sealant, which is to be dispensed. Examples are disclosed in Patent document EP-B-0243393 (Rocep Lusol Holdings Limited). However, known arrangements have several disadvantages. For example, the cost of components used in the manufacture of such known apparatus is high. The valve mechanism comprises a large number of separate parts which must be assembled together. Automatic assembly of such apparatus is complicated and costly.

It is an object of the present invention to provide a dispensing apparatus which overcomes one or more of the above disadvantages.

According to the present invention there is provided a dispensing apparatus for dispensing a product from a container, said apparatus comprising:

a product chamber within the container;

a valve adjacent to the product chamber;

a hinge assembly;

a lever hingedly attached to the hinge assembly and having a bearing portion; and

a nozzle assembly sealingly engageable with the hinge assembly,

the nozzle assembly being rotatable between open and closed positions and including an actuator portion provided with a cam surface which cooperates with the lever bearing portion such that in the open position operation of the lever causes movement of the actuator portion to open the valve and permit flow of the product out of the apparatus.

Preferably the apparatus comprises means for urging the product from the product chamber. Preferably the product chamber is pressurised. The product chamber may contain a propellant. The product chamber may contain a piston, situated between the propellant and the valve.

Preferably the valve is a tilt valve. Tilt valves are generally known in dispensing apparatus and operate by tilting of a hollow central stem which is resiliently held on a mounting cup by a rubber grommet. The stem is closed at its lower end by a sealing plate. When the stem is tilted, the seal between the grommet and the sealing plate is broken and the product can reach apertures in the central stem and thence flow along the hollow stem.

Preferably the valve comprises a mounting cup adapted to secure the valve to the container. Preferably the container is provided with a rolled flange portion and the mounting cup is provided with a corresponding flange portion adapted to engage with the rolled flange portion of the container.

Preferably the actuator portion comprises a ring member arranged at a lower end of the nozzle assembly. Preferably the cam surface comprises one or more depressions and one or more raised surfaces. Preferably when the nozzle assembly is in the closed position the lever bearing portion is adapted to bear upon one of said depressions, and when the nozzle assembly is in the open position the lever bearing portion is adapted to bear upon one of said raised surfaces.

Preferably the lever comprises two lever bearing portions arranged at opposite sides of the valve. Preferably the cam surface comprises two depressions arranged at opposite sides of the ring and two raised surfaces arranged between the depressions at opposite sides of the ring.

Preferably the nozzle assembly is provided with means to limit the rotational travel of the nozzle assembly between the closed position and the open position. These means may comprise two end stops provided on the nozzle assembly adapted to locate against an upstand on the hinge assembly.

The nozzle assembly may be provided with fin members adapted to hold the lever bearing portion against the cam surface. The fin members may be of different lengths. Preferably a fin member is provided at each depression and each raised surface of the cam surface, spaced from the cam surface to allow the insertion of the lever bearing portion between the fin member and the cam surface.

Preferably the nozzle assembly comprises one or more dog teeth and the hinge assembly comprises one or more slots, adapted such that a dog tooth can enter a slot only when the nozzle assembly is in the open position. The nozzle assembly is preferably coupled to the valve stem for longitudinal movement, such that movement of the nozzle assembly towards the container causes the dog tooth to enter the slot and the valve stem to move, thereby opening the valve to release the product.

Preferably, the container is made substantially from aluminium and is most preferably an aluminium monoblock container. Alternatively the container may be a wall ironed tin plate can, or an extruded tin plate can as used in the beverage industry, without a side seam.

BRIEF DESCRIPTION OF THE DRAWINGS

Specific embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIGS. **1**(*a*) and **1**(*b*) are a side view in cross-section and an end view respectively of a dispensing apparatus in accordance with an embodiment of the present invention in a closed position;

FIGS. **2**(*a*) and **2**(*b*) are a side view in cross-section and an end view respectively of the dispensing apparatus of FIGS. **1**(*a*) and **1**(*b*) in an open position with the valve closed;

FIGS. **3**(*a*) and **3**(*b*) are a side view in cross-section and an end view respectively of the dispensing apparatus of FIGS. **1**(*a*) and **1**(*b*) in an open position with the valve open;

FIG. **4** is an enlarged view of the valve area of the apparatus of FIG. **1**(*a*);

FIG. **5** is an enlarged view of the valve area of the apparatus of FIG. **2**(*a*);

FIG. **6** is an enlarged view of the valve area of the apparatus of FIG. **3**(*a*);

FIGS. **7**(*a*), **7**(*b*), **7**(*c*) and **7**(*d*) are sectional views of the valve, nozzle end cap, lever and hinge assembly respectively of the apparatus of FIG. **1**(*a*);

FIG. **7**(*e*) is an end view on the hinge assembly of FIG. **7**(*d*);

FIGS. **7**(*f*), **7**(*g*) and **7**(*h*) are a bottom view, side view and top view respectively of the nozzle assembly of the apparatus of FIG. **1**(*a*); and

FIGS. **8**(*a*), **8**(*b*) and **8**(*c*) are a bottom view, sectional side view and front view respectively of a hinge assembly of an apparatus according to a second embodiment of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIGS. **1** to **7** of the accompanying drawings, an apparatus in accordance with an embodiment of the

present invention will be described. The apparatus will be referred to hereinafter as a "pressure pack" or "pack". The pressure pack of FIGS. **1** to **3** is generally denoted **10**.

The pack **10** consists generally of a canister section and a valve section.

In this example, the canister section **12** comprises an aluminium monoblock container of the sort widely used in aerosol applications. It is envisaged that the can **12** could he of tin plate, steel or any conventional can construction having a standard one inch (25 mm) hole in the top. The can may be internally lacquered.

The pack **10** is automatically assembled as follows. Firstly a subassembly is formed from a valve **14**, a hinge assembly **16**, a lever **18** and an actuating nozzle **20**. The valve is a tilt valve of the type widely used in pressurised dispensers and operated by tilting the valve stem **30**. The valve stem **30** is a hollow plastic tube with apertures **32** in the tube wall at the lower end. The upper end **34** is open, while the lower end is closed by a plastic sealing disc **36**. A resilient grommet **38** of rubber or synthetic material surrounds the lower portion of the stem **30** and is held in place by the sealing disc **36** and a retaining collar **31** formed on the outside of the stem **30**.

The grommet **38** is provided with a circumferential groove **40** and a sealing web **42** which house a mounting cup **44** of metal. The mounting cup has an inner flange **46**, which sits sealingly inside the groove **40** on the grommet, and an outer flange **48** which is adapted to fit around a rolled flange **13** which extends around the opening of the container **12**. When the stem **30** is pushed in the direction of arrow A relative to the mounting cup **44**, the sealing disc **36** is pushed away from the grommet **38**, and material in the canister **12** is free to pass between the sealing disc **36** and grommet **38**, through the apertures **32**, along the inner bore of the stem **30** and through the open end **34** of the stem. When the stem is released, the resilience of the grommet **38** pushes the stem back in a direction opposite to arrow A and seals the valve again. If the stem is pushed to one side in the direction of arrow B, one side of the sealing disc **36** is pushed away from the grommet **38**, and material in the canister **12** is again free to pass between one side of the sealing disc **36** and grommet **38**, through the apertures **32**, and out of the stem **30**. The hinge assembly can be seen more clearly in FIGS. **7**(*d*) and **7**(*e*). The hinge assembly **16** is moulded from plastic and comprises a ring **60** having a central aperture **62**. The ring **60** is provided with a circumferential groove **64** adapted to snap on to the outer flange **48** of the mounting cup. A discontinuous flange **66** projects into the aperture **62**, forming two slots **68**, whose purpose is explained later. An upstand **70** is provided with a through bore **72** adapted to house the ends of a wire lever **18**, thereby forming a hinge for the lever. The lever **18** comprises a handle **102**, which extends along the side of the canister **12**, and a lever arm **104**. The lever **18** is preferably formed from a single piece of wire, whose two free ends are mounted in opposite sides of the upstand **70**.

The nozzle assembly **20** comprises an elongate tapering nozzle **80** with a removable end cap **82**, which may be click-fit, screw-fit or simple taper fit. The nozzle assembly is free to rotate about its longitudinal axis relative to the hinge assembly **16** and lever **18**.

In the illustrated embodiment of FIGS. **1** to **7** the rotation is limited by two end stops **84***a* and **84***b*, which come into contact with bevelled contact surfaces **74***a* and **74***b* formed on the upstand **70** of the hinge assembly **16**. When end stop **84***a* is in contact with surface **74***a*, the nozzle is in the closed position. When the nozzle is rotated by 45° in a counter-clockwise direction, so that end stop **84***b* is in contact with surface **74***b*, then the nozzle is in the open position.

When the dispenser is transported and is stored before first use, a removable tab **86** attached to the base **90** of the nozzle assembly prevents any rotation of the nozzle from the closed position by bearing on contact surface **74***b* on the upstand **70**. only after removal of the tab, by folding and snapping or tearing, can the nozzle be rotated in a counter-clockwise direction. It is to be understood that the provision of a locking tab **86** is optional, and the invention may function without a locking tab.

The nozzle assembly is provided with four fins, two shorter fins **92** and two longer fins **94**. The base **90** of the nozzle serves as an actuator to control the opening of the valve and is provided with a cam surface which has two depressions **98** adjacent to the longer fins **94** and two raised surfaces **96** adjacent to the shorter fins **92**. The lever arm **104** of the lever **18** has a bearing portion loo which is adapted to fit between the longer fin **94** and the depression **98** when the nozzle assembly is in the closed position. Upon rotation of the nozzle assembly, the longer fin moves away from the bearing portion **100**, so that the bearing portion **100** is free to rise, and the cam surface pushes the bearing portion up until it is raised to the level of the raised surface **96**, where it is held between the shorter fin **92** and the raised surface **96**.

As the bearing portion **100** is raised, the handle **102** on the lever **18** is moved away from the side of the canister **12**, from the position shown in FIG. **1**(*a*) to that shown in FIG. **1**(*b*).

In an alternative embodiment of the invention, not illustrated, the end stops on the nozzle assembly are omitted. The nozzle assembly is provided with an internal thread which mates with an external thread on the valve stem **30**. The nozzle assembly is secured to the valve stem by turning in a clockwise direction until the shoulder **120** on the inside of the nozzle bears on the collar **31** on the outside of the valve stem. Further rotation of the nozzle assembly in a clockwise direction causes both the nozzle assembly **20** and the valve stem **30** to rotate together relative to the grommet **38** and can **12**. The base of the nozzle has a cam surface, as described previously, but the nozzle assembly does not stop automatically when the open position is reached. A first rotation in the clockwise direction brings the nozzle to the open position, while further rotation in the clockwise direction brings it back to the closed position, and so on.

Referring again to FIGS. **1** to **7**, the base **90** of the nozzle is provided with a cylindrical extension **110** which has an internal diameter adapted to fit slidably around the inner flange **46** of the mounting cup **44**. The inner surface of the cylindrical extension **110** engages with a protruding part **41** of the grommet **38** adjacent to the groove **40**, to form a seal which prevents the product passing between the valve **14** and the nozzle **80**.

Arranged outside the extension **110** are two dogs **112**, which in the closed position of the nozzle are aligned on top of the flange **66** in the hinge assembly. In this position the nozzle assembly **20** cannot be moved in the direction of arrow A relative to the hinge assembly **16**, because the dogs **112** will interfere with the flange **66**. However, when the nozzle is rotated to the open position the dogs **112** are aligned with the slots **68** formed by the gaps in the flange **66**, and the nozzle assembly **20** can be moved in the direction of arrow A, so that the dogs **112** enter the slots **68**.

It is to be understood that the nozzle assembly may be provided with only one dog **112**, and the hinge assembly with only one slot **68**.

When the nozzle assembly is in the open position, as in FIGS. **2** and **3**, then depression of the handle **102** towards the canister **12** causes the bearing portion **100** of the lever **18** to push the nozzle assembly **20** in the direction of arrow A towards the hinge assembly **16**. The nozzle assembly is linked to the valve stem **30** to prevent relative longitudinal movement of the valve **14** and nozzle **80**. The linking means may comprise a thread or a rib and groove arrangement. In the example of FIGS. **4** to **6** three seals **140** are provided on the outer bore of the valve stem **30**. These seals **140** seal between the valve stem **30** and the nozzle **80** and prevent product being forced back down between the valve stem **30** and nozzle **80** by back pressure in the nozzle **80**.

An alternative method of sealing is shown in FIG. **7**, in which the inside of the nozzle **80** is provided with an annular projection **114** which seals between the nozzle **80** and the valve stem **30** to prevent any product passing between the nozzle **80** and the valve stem **30**. An external thread **116** is provided on the valve stem **30** which engages with a corresponding internal thread (not shown) on the nozzle **80** to prevent relative longitudinal movement of the valve **14** and nozzle **80**.

As can be seen in FIG. **6**, a shoulder **120** on the inside of the nozzle **20** bears on the collar **31** on the outside of the valve stem **30** and pushes the valve stem against the resilience of the grommet **38** in the direction of Arrow A. This causes the disc **36** to move away from the grommet and allow product to be expelled under pressure from the canister through the nozzle **80**.

The nozzle assembly **20** is a single moulded piece of plastic. The nozzle assembly **20**, the hinge assembly **16** and the lever **18** can be preassembled to form a complete nozzle/hinge sub-assembly and then secured to the canister **12** during the filling process. The nozzle/hinge sub-assembly of the invention is much simpler and cheaper than prior art sub-assemblies, because it uses only three components. The valve, being an off the shelf tilt valve having only three parts, namely the stem **30**, grommet **38** and mounting cup **44**, may be obtained cheaply and easily. In practice the container is filled, the valve **14** is secured to the container by crimping the flange **48**, then the nozzle/hinge assembly is snapped onto the mounting cup of the valve.

The stroke of the valve is limited by the clearance X between the lower end of the extension **110** and the top of the mounting cup **44** adjacent to the inner flange **46**. The length of the extension **110** is therefore carefully chosen depending on the flow characteristics of the product to be dispensed.

Before filling the can **12** with product and before fitting the valve and nozzle/hinge assembly, a piston assembly (not shown) is inserted into the can **12**. A suitable piston assembly is described in our co-pending International Patent Application No PCT/GB98/03003. However the piston assembly does not form part of the present invention, and any suitable automatic or manual pressure inducing arrangement may be used in connection with the apparatus of the present invention, including conventional aerosol cans.

To dispense a product, the tab **86** is broken, the end cap **82** is removed and the nozzle **80** may be cut open, if it is not supplied already open. The nozzle assembly **20** is then twisted relative to the hinge assembly **16**. Twisting is made easy by the provision of the four fins **92, 94**, which are readily grasped by hand. A **900** turn will fully open the pack. As the nozzle assembly **20** turns, the lever handle **102** lifts on the hinge **72** due to the action of the camming surface **96, 98** against the bearing portion **100** of the lever arm **104**. This can be seen in the view of FIGS. **2**(*a*) and **2**(*b*).

To dispense product, a user then presses down on the lever handle **102** (moving it toward the body of the can **12**). This pushes the nozzle assembly **20** and valve stem **30** down relative to the hinge assembly **16**, as described above. This is the position seen in FIGS. **3**(*a*) and **3**(*b*). Product is then urged to flow, by virtue of the internal pressurisation of the pack through the ports **32** and up through the valve stem **30** and out through the nozzle **80**.

To stop dispensing, the user simply releases the lever handle **102**. This closes the valve by allowing the valve stem **30** to slide back and close access through the ports **32**.

Although FIGS. **1** to **7** show a simple camming surface in which there are two positions, a closed position in which the valve is fully closed and the dog cannot locate in the slot, and an open position in which the valve is fully open and the dog can locate in the slot, it is in the scope of the present invention to provide a more sophisticated camming surface, which may provide intermediate raised surfaces, whose height is between that of the depression **98** and highest raised surface **96**. Further slots may be provided in flange **66** corresponding with the intermediate camming surfaces, so that the valve may be actuated in one or more intermediate, partially open positions. Alternatively the dogs **112** and flange **66** may be omitted, thereby simplifying the operation of the apparatus so that the valve can be actuated in any rotational position of the nozzle, the degree of rotation determining the extent to which the valve will open when actuated. Detent grooves may be provided in the camming surface, adapted to cooperate with the bearing portion **100** of the lever, to give a positive click action when the nozzle is rotated to an open position.

FIG. **8** shows an alternative form of hinge assembly **116**, made of steel, alloy or other metal. The assembly comprises a ring **130** which fits around the rolled flange **13** of the container **12** before the mounting cup **44** of the valve **14** is fixed to the flange **13**. Fixing the mounting cup holds the ring **130** in place. The upstand **132** and hinge **134** are formed by bending the single flat sheet of metal from which the hinge assembly **116** is formed. The bearing surfaces **136***a*, **136***b* at the end of the upstand **132** serve the same purpose as the bearing surfaces **74***a*, **74***b* described above with reference to FIGS. **7**(*d*) and **7**(*e*).

Modifications and improvements may be made to the foregoing without departing from the scope of the invention. In particular the dog mechanism may be omitted if there is another means of ensuring that the nozzle is not accidentally depressed, for example the provision of an outer cap which fits over the whole assembly on to the top of the canister. Similarly the fins may be omitted, and the lever may be retained in some other way, or may be free to rise away from the cam surface.

What is claimed is:

1. A dispensing apparatus for dispensing a product from a container, said apparatus comprising:

a container;

a product chamber within the container;

a tilt valve adjacent to the product chamber and having a valve stem provided with an external thread;

a hinge assembly attached to the container;

a lever hingedly attached to the hinge assembly and comprising a bearing portion; and

a nozzle assembly sealingly engageable with the hinge assembly and provided with an internal thread engaged with the external thread of the valve stem,

the nozzle assembly being rotatable relative to the hinge assembly and the lever between open and closed posi-

tions of said nozzle assembly and including an actuator portion provided with a surface which cooperates with the lever bearing portion such that in the open position of said nozzle assembly operation of the lever causes movement of the actuator portion to open the valve and permit flow of the product out of the apparatus.

2. A dispensing apparatus according to claim **1** further comprising means for urging said product from said product chamber.

3. A dispensing apparatus according to claim **1** wherein said actuator portion comprises a ring member and wherein said surface of said actuator portion is a cam surface and comprises at least one depression and at least one raised surface.

4. A dispensing apparatus according to claim **3** wherein said cam surface comprises two depressions arranged at opposite sides of said ring member and two raised surfaces arranged between the depressions at opposite sides of said ring member.

5. A dispensing apparatus according to claim **3** wherein said lever bearing portion is adapted to bear upon one of said depressions when said nozzle assembly is in the closed position and said lever bearing portion is adapted to bear upon one of said raised surfaces when the nozzle assembly is in the open position.

6. A dispensing apparatus according to claim **1** wherein said lever comprises two lever bearing portions arranged at opposite sides of said valve.

7. A dispensing apparatus according to claim **3** wherein said nozzle assembly is provided with one or more fin members adapted to hold the lever bearing portion against the cam surface.

8. A dispensing apparatus according to claim **7** wherein one of said one or more fin members is provided at each depression and at each raised surface of the cam surface, and wherein each one of said one or more fin members is spaced from the cam surface to allow the insertion of the lever bearing portion between said each one of said one or more fin members and the cam surface.

9. A dispensing apparatus according to claim **1** wherein said container is made from aluminum.

* * * * *